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USING THE BLIZZARD-WIZARD FOAM MAKING SYSTEM

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Several methods of introducing foam concentrate into water during the pumping process have been developed; the around-the-pump eduction system is one such method. Eduction is executed by diverting a small amount of water from the pump discharge side through a water thief to the venturi assembly in the mixing device. The amount of foam concentrate drawn in, and the resulting mix ratio, is regulated by the amount of water flow and the position of the metering valve. The Blizzard-Wizard Foam Eductor operates on this principle. The amount of water flow is governed by the length of the hose line and the size of the nozzle used at the discharge end. Therefore, compensatory valve adjustments must be made as hose line length or nozzle type changes are made. Another factor that must be considered when foam quality adjustments are made is the viscosity of the foam concentrate. Different foam concentrate brands have different viscosities at any given temperature and their viscosities increase at different rates as the temperature decreases.

Trials using the Blizzard-Wizard system were conducted with a Wajax Mark 3 unit operating at full throttle, a Blizzard-Wizard Eductor, unlined 38 mm hose, and a Co-Son HF-32 aspirating nozzle (except where indicated).

Viscosity Effect

Silv-Ex and Forexpan had similar viscosities over the entire temperature working range (3°C to 35°C). Monsanto WD-881 and Chemonics #103 had comparable viscosities at higher temperatures, but at lower temperatures they diverged (Figure 1).

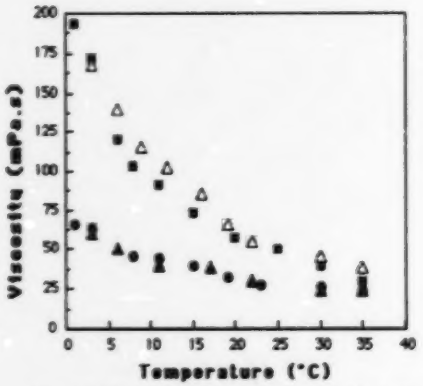

Figure 1. Temperature/viscosity relationship for foam concentrates: Forexpan, ●; Silv-Ex, ▲; WD-881, ■; and Chemonics #103, Δ.

Consequently, a value-setting correction was required whenever a product change was made or when concentrates of different temperatures were educted. Although viscosity/temperature for WD-881 can be expressed by a linear equation ($Y = 0.194 + 0.011X$), the eduction rate is best estimated using an exponential equation $Y = 196.26 \times 10^{-0.0259X}$ (Figure 2).

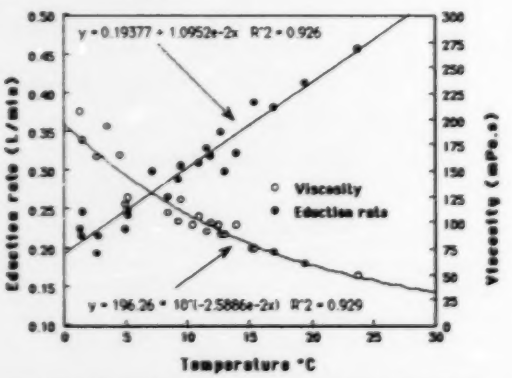

Figure 2. The relationship of viscosity and the eduction rate (@ no. 6 setting) relative to the temperature of WD-881 foam concentrate.

The resistance to flow for the more viscuous WD-881 resulted in an increasingly lower eduction rate (Figure 3), compared to that for Silv-Ex (Figure 4) for which the eduction rates and mix percentages were non-linear when the metering valve was stepped through the six settings. A less than two times increase in viscosity resulted in a threefold decrease in volume flow for WD-881 at setting No. 6.

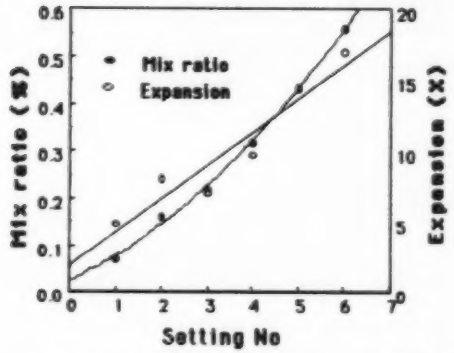

Figure 3. The mix ratios and expansions obtained for WD-881 (@ 30°C) for the six settings of the Blizzard-Wizard eductor.

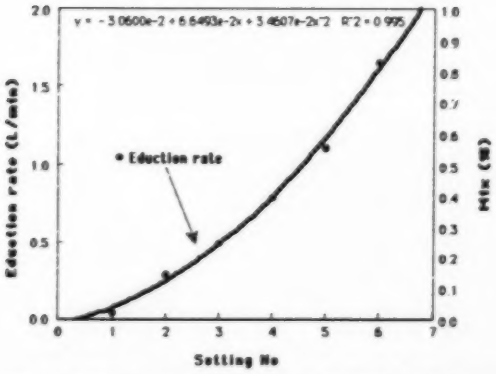

Figure 4. The rate of eduction of Silv-ex (@ 25°C) and the mix ratios for the six Blizzard-Wizard eductor settings.

Hose Line Length Effect

The friction within the hose line reduced the discharge output as line length increased and the output was further tempered by the size of the discharge nozzle in use (Figures 5 and 6).

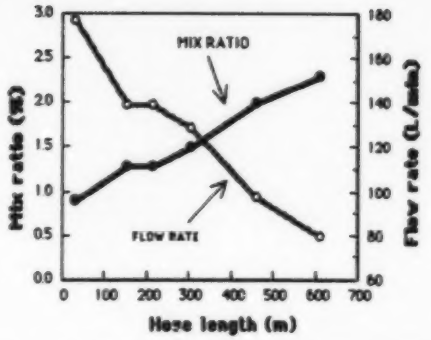

Figure 5. Hose line length effect on Silv-ex mix ratio percentage and volume output using an HF-32 nozzle.

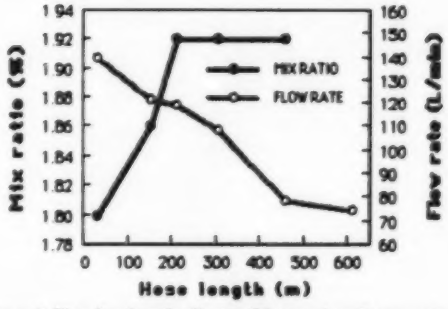

Figure 6. Hose line length effect on Silv-ex mix ratio percentage and volume output using a MF-16 nozzle.

The change in mix ratio percentage was due primarily to the reduction in water flow output as line length increased, for there was only a slight change in the eduction rate. A change in hose line length from 30 m to 450 m increased the mix ratio by 1.1% (from 0.9% to 2.0%) at setting No. 6. The appropriate reduction in eduction would have been to set the value at about No. 4 to compensate for the addition of 420 m of hose. The non-linearity exhibited between valve setting and eduction rate (Figure 3) confirmed the need to develop independent calibration curves for operational use for each nozzle/hose type combination.

Nozzle Performance

Foam generated by any given nozzle has a higher expansion as mix ratios increase but expansion does not vary much with changes in hose line length. Expansion for WD-881 foam changed

from 5 X @0.07% (setting #1) to 17 X @0.06% (setting #6) when the nozzle was 30.5 m from the pump but it varied only between 17 X and 19 X as the hose length increase to 610 m (setting #6). Drainage rates did not follow expansion. The foam generated by the HF-32 nozzle at 610 m had an expansion of 18 X (setting #6, 1.2%) and drained at the same rate as the foam at 30.5 m which had an expansion of only 7 X (setting #3, 0.22%) (Figure 7).

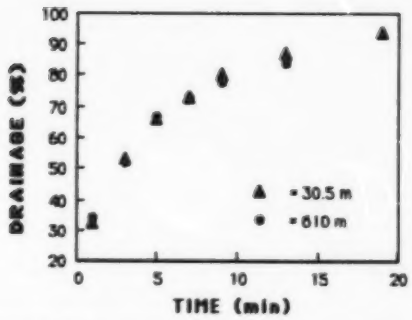

Figure 7. Drainage rates for WD-881 foam generated by HF-32 nozzle at 30.5 m (setting #3, 0.22%) and at 610 m (setting #6, 1.2%).

Although the expansion for foam generated at setting #6 did not change much in expansion, the quality of the foam declined in terms of drainage rate as hose line length increased (Figure 8). The cause of this reduction in foam stability was due to reduced aeration efficiency as hose length increased.

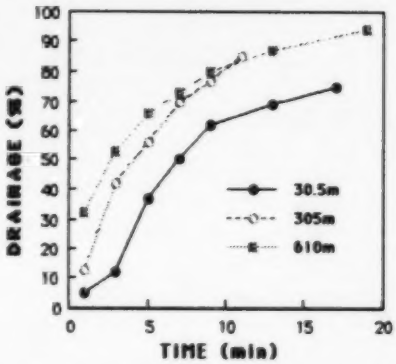

Figure 8. Drainage rates for WD-881 foam generated by HF-32 nozzle at 30.5 m (——), 305 m (----), and 610 m(.....) from the pump. The respective mix ratio were 0.6%, 0.8%, and 1.2%.

Recommendations

The Blizzard-Wizard foam making system must be calibrated for the particular foam concentrate and for hose types and lengths normally used under operational conditions. Knowledge of what adjustments or nozzle changes are required to produce the desired quality of foam is essential to efficient fire suppression.

This paper is merely an assessment of a product by Forestry Canada and not an endorsement. Alternative products may be commercially available.

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